

Commercial Applications of Spaceport Cryogenic Technologies: Technologies, Facilities, Capabilities, and Expertise

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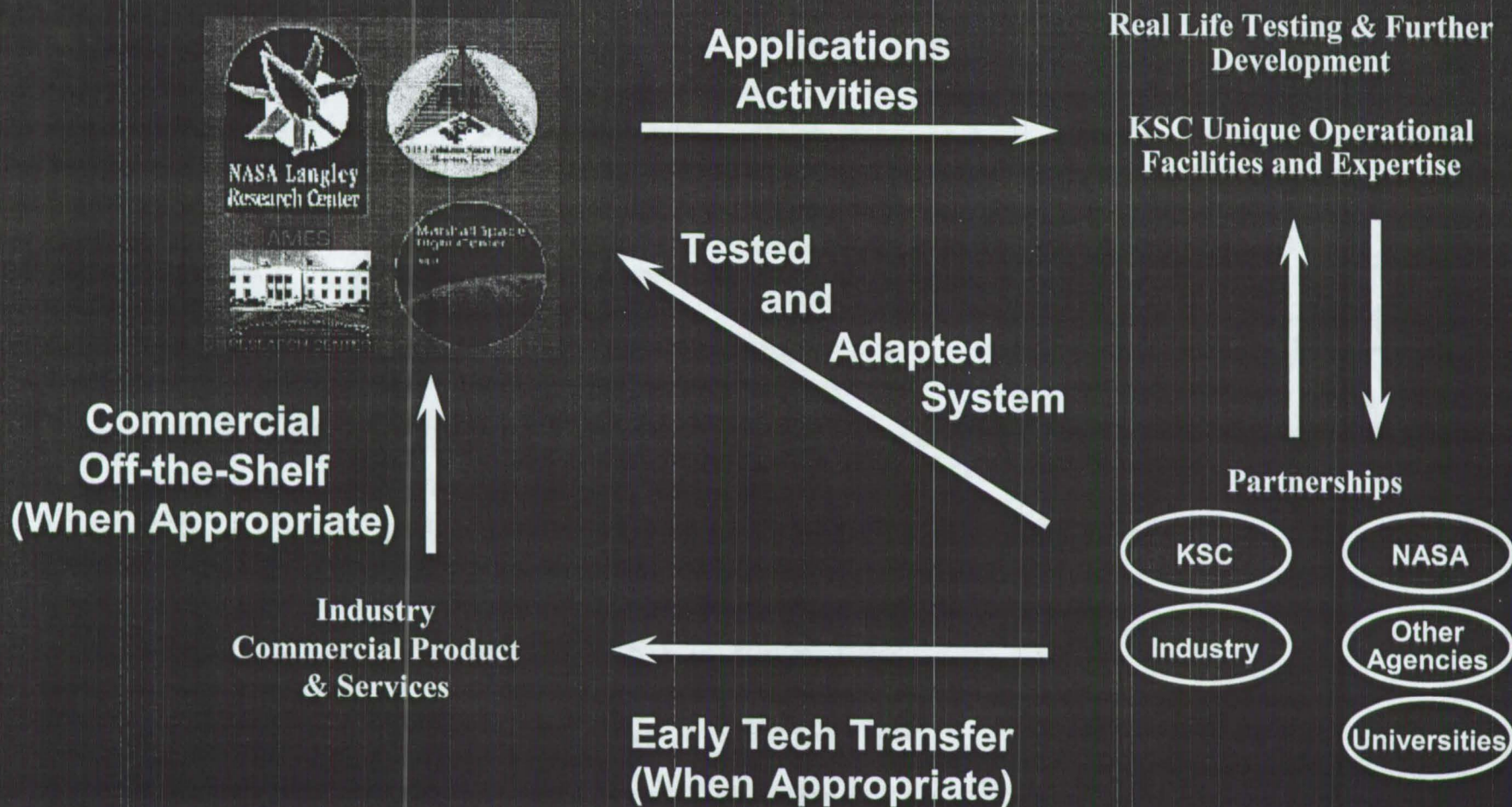
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James Fesmire NASA-KSC

April 27, 2004

KSC as Testbed for New Technologies

Partner to develop new technologies
for future space initiatives



Cryogenics Testbed Mission

Increase KSC's reputation in applied R&D

Promote the use of innovative technology

Expand external partnerships

Increase KSC's core competency in fluid and fluid systems

Technology Focus Areas

Thermal Insulation Systems

Cryogenic Components

Low-Temperature Applications

Propellant Servicing Systems

Cryogenic Testbed Capability

People

Facilities

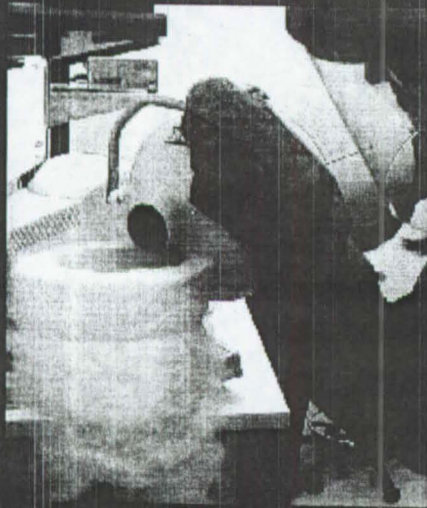
Equipment/Systems

Cryogenic Network

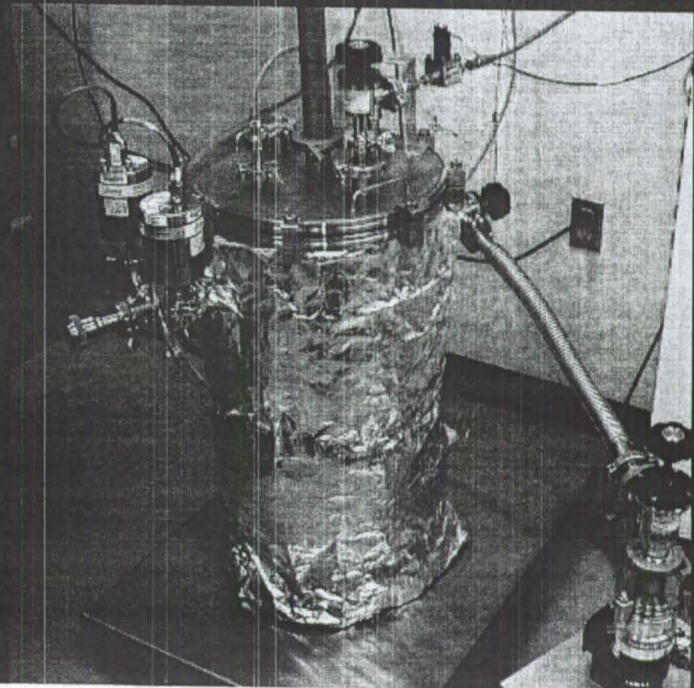
Cryogenic Testbed services span the entire spectrum of new product development needs

Research & Development
Engineering
Analysis
Test Operations
Instrumentation
Fabrication

Facilities

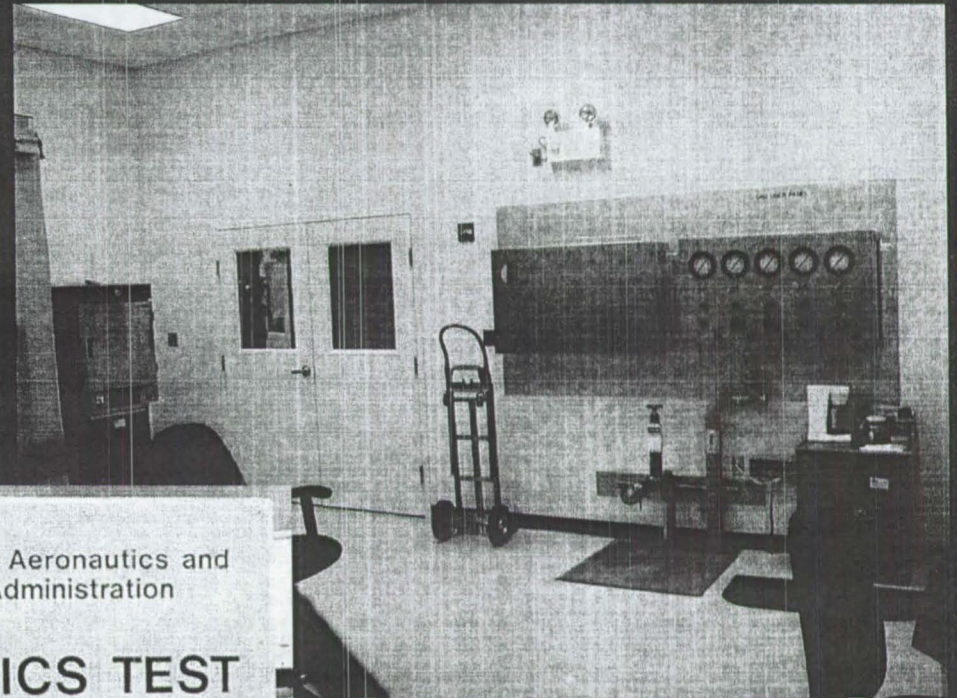
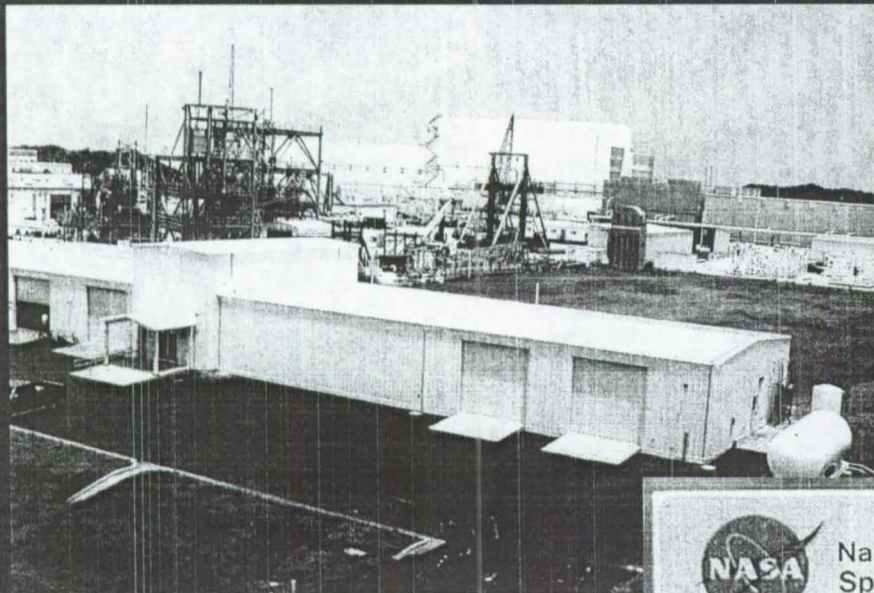


Cryogenics Test Laboratory
Advanced Technology Development
Center
Launch Equipment Test Facility



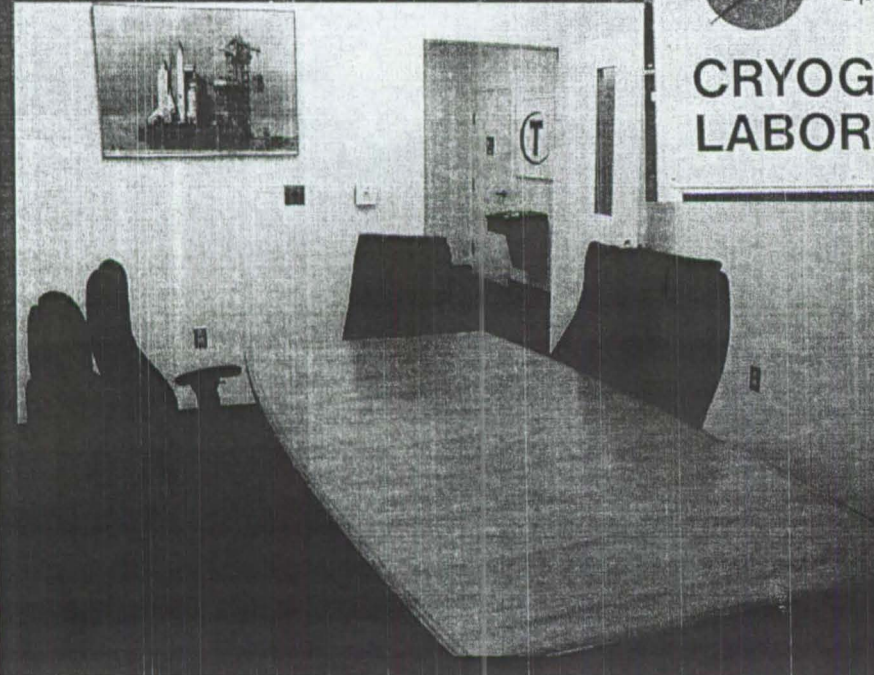
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■ Cryogenics Testbed Laboratory

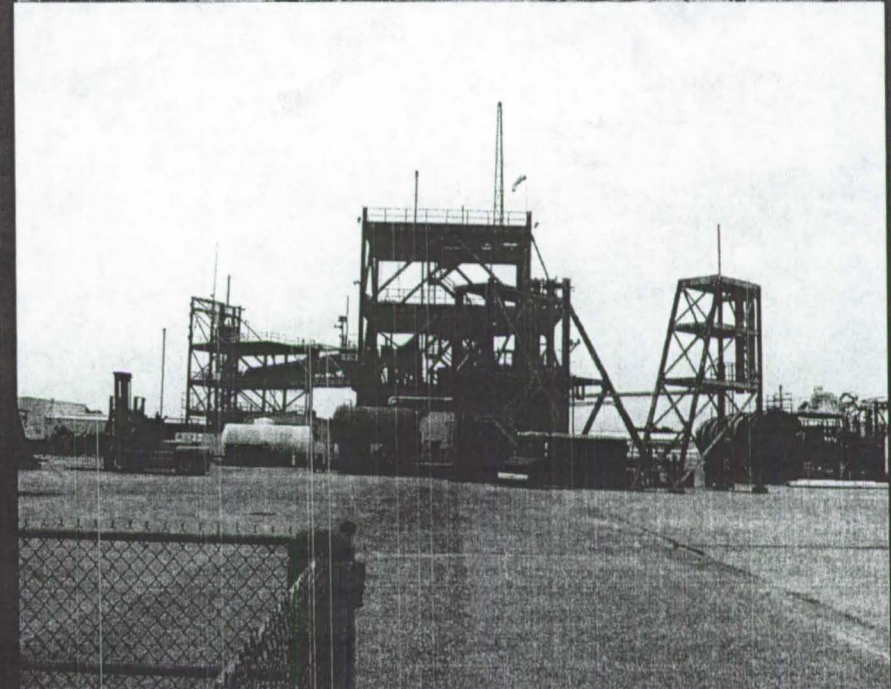
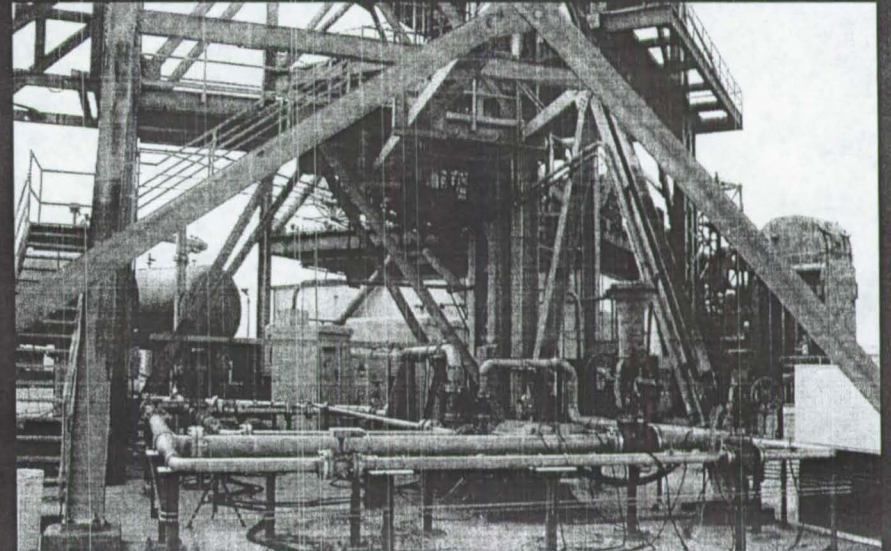
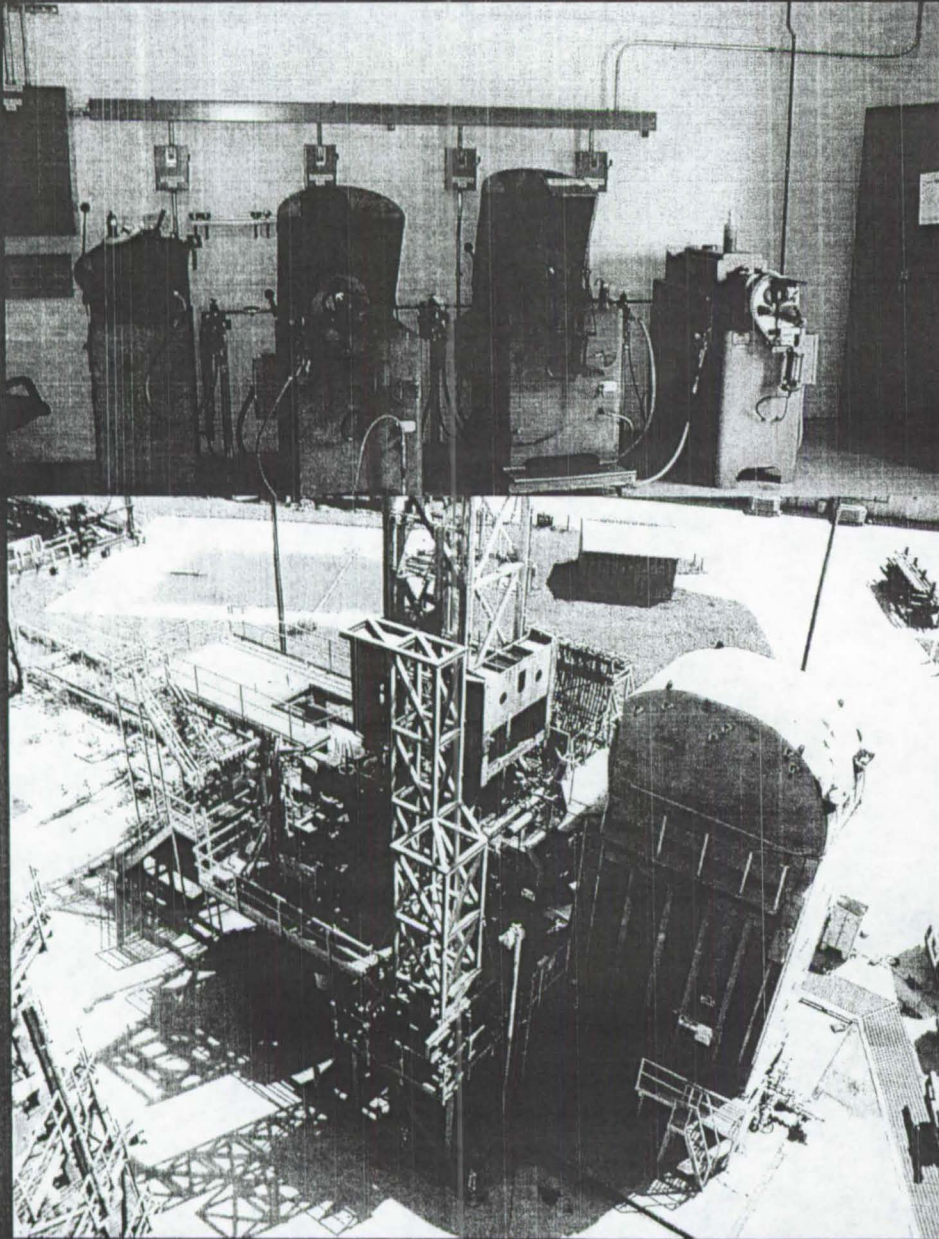


National Aeronautics and
Space Administration

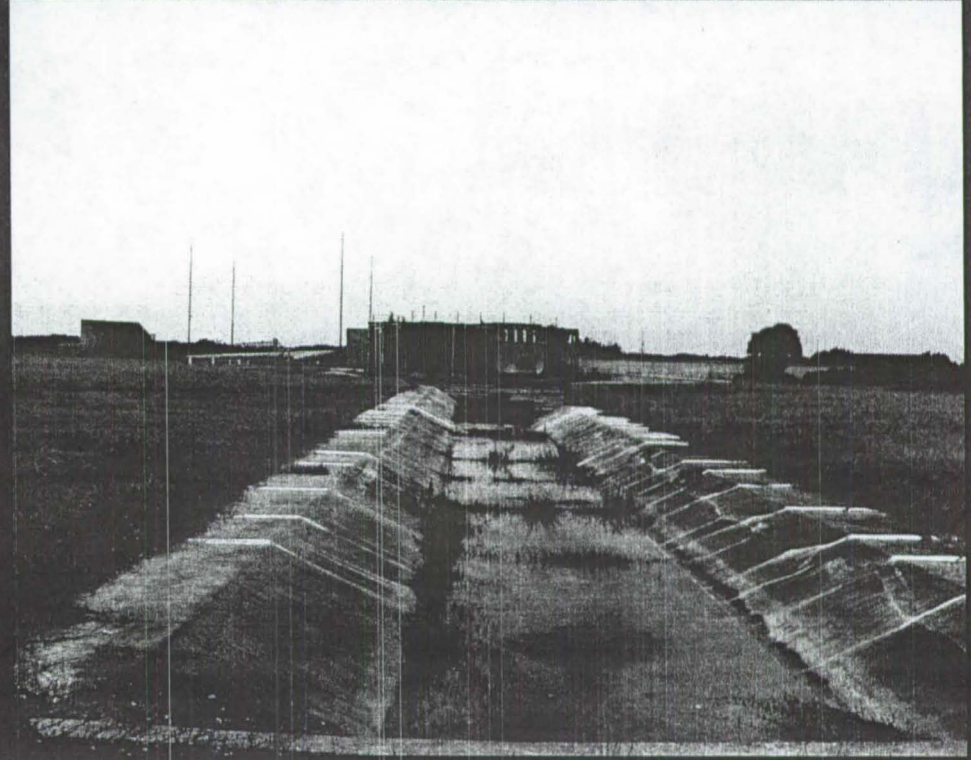
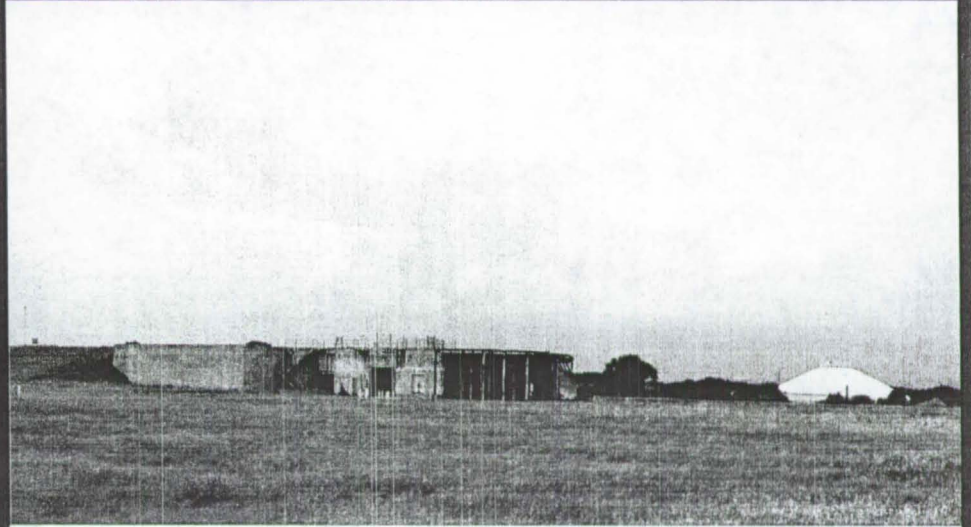
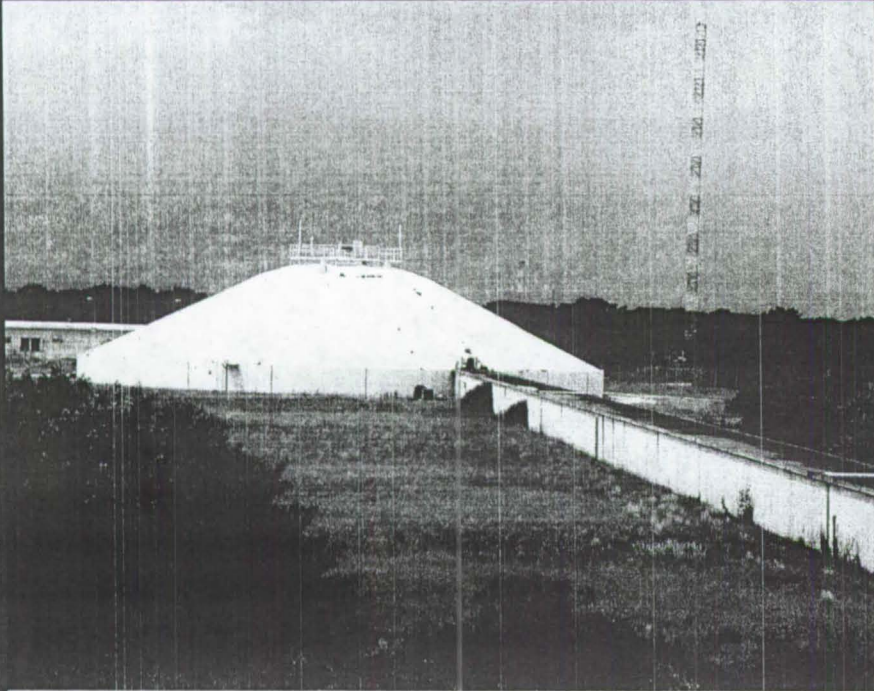
**CRYOGENICS TEST
LABORATORY**



■ Launch Equipment Test Facility



■ Advanced Technology Development Center



Network

NASA Cryogenics Working Group

Cryogenic Society of America
(CSA)

American Institute of Aeronautics
and Astronautics (AIAA)

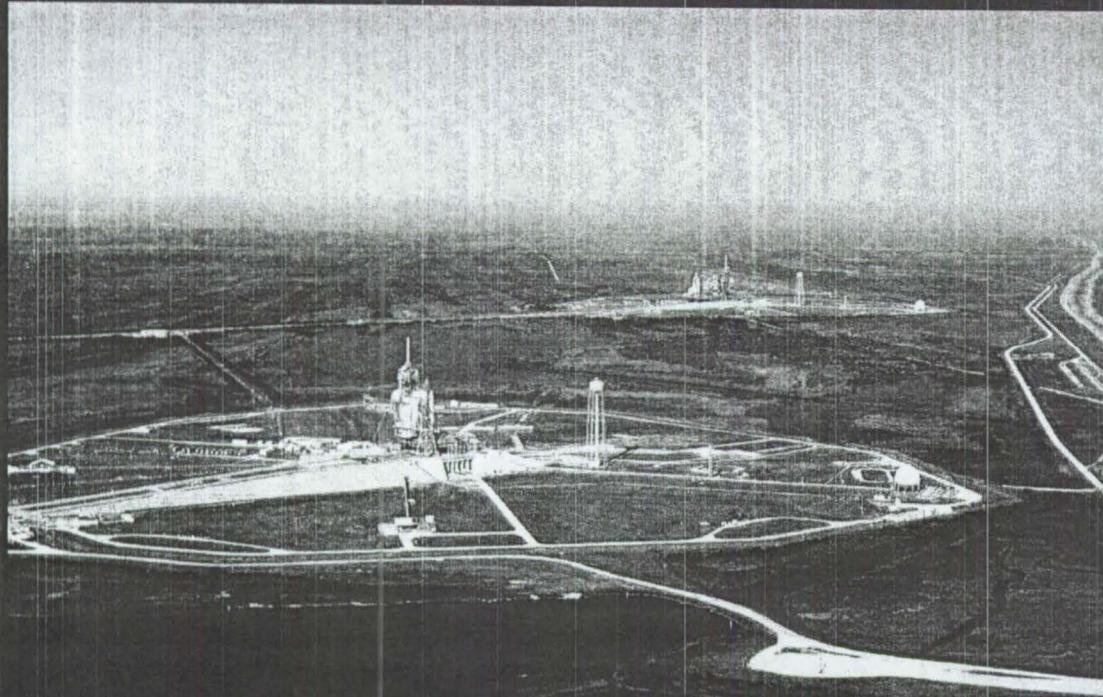
Cryogenic Information Center

International Institute of
Refrigeration (IIR)

Energy Efficient Cryogenics

**Spaceport facilities
Space exploration
Industry**

Energy Efficient Cryogenics



Spaceport facilities

- ◆ Energy integrated launch site
- ◆ Advanced transfer and storage methods
- ◆ Propellants and gases production
- ◆ Novel components and instrumentation
- ◆ New material applications

Energy Efficient Cryogenics

Space exploration

- ◆ Earth orbit space depots
- ◆ Moon base
- ◆ Mars base
- ◆ Interplanetary

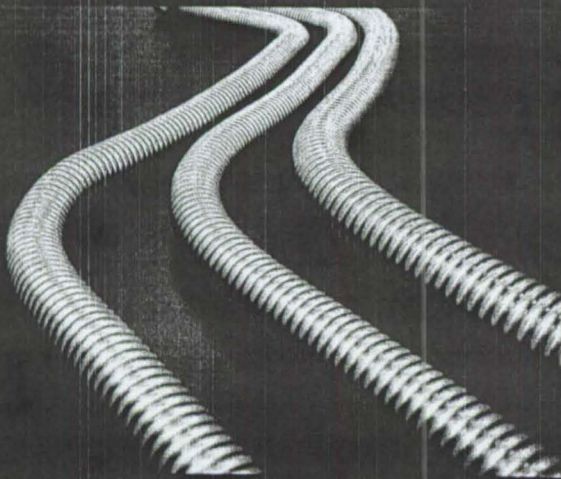
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Energy Efficient Cryogenics

Industry

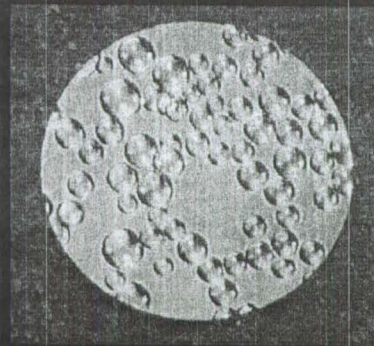
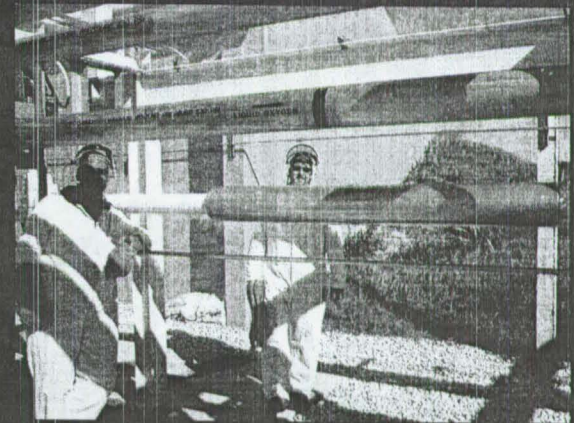
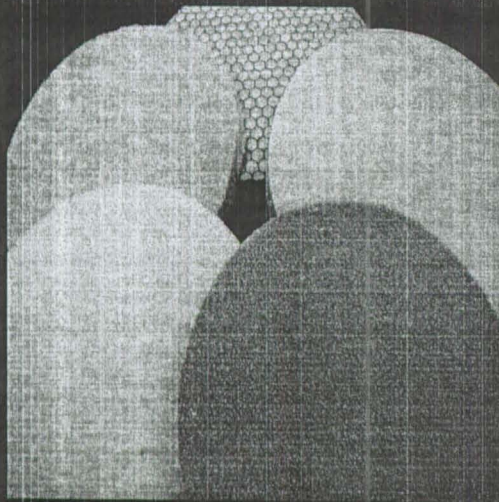
- ◆ Hydrogen Transportation
- ◆ Superconducting Power
- ◆ Processes & Applications



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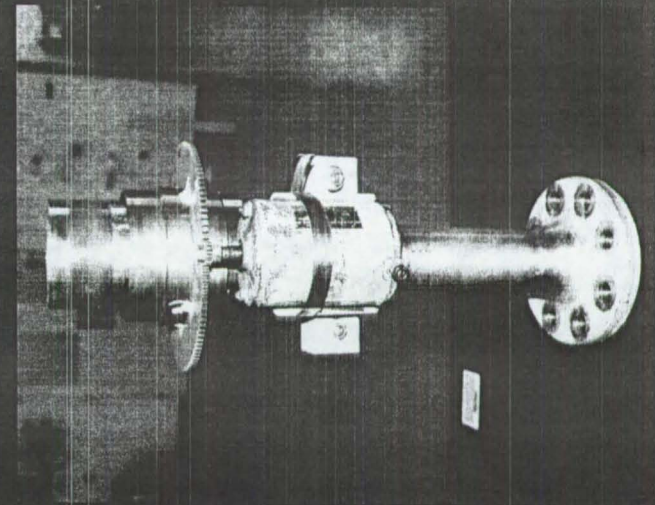
Thermal Insulation Systems

Aspen Aerogels
Cabot Systems
Technical
Applications Inc.

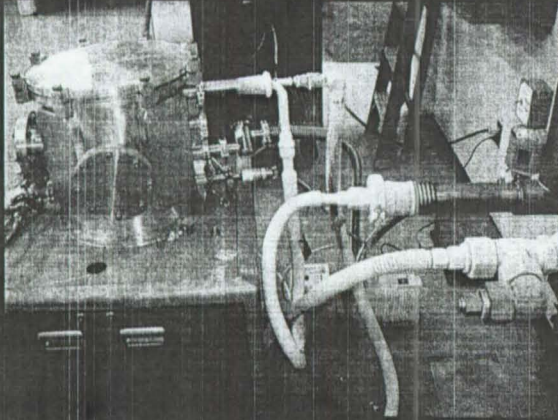


Cryogenic Components

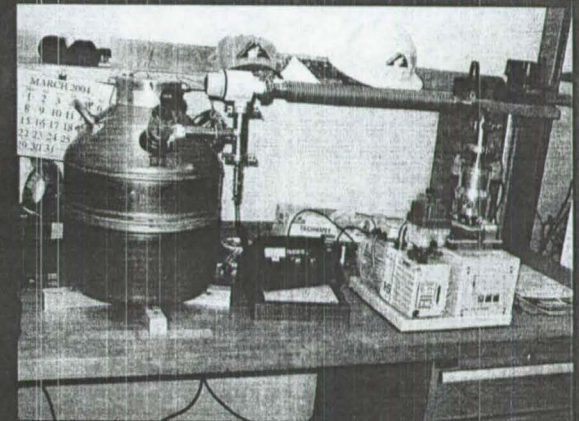
Big Horn Valve
Inc. Cryogenic
Valve
Development
Automated
Umbilical
Technology
Development



Low Temperature Applications



UCF/LANL
Thermal Vacuum
Chamber
Integration
Space Life
Sciences Lab
Freezer
Performance
Evaluation



Propellant Servicing Systems

Shuttle – LH2
Storage Tank
Insulation
Replacement
Study

Chart Industries –
Insulated Piping
System Testing

Cryo-Tracker
Mass Gauging
System

